(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 968 767 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.01.2000 Bulletin 2000/01

(51) Int. Cl.[7]: **B05B 11/00**

(21) Application number: **98830389.7**

(22) Date of filing: **30.06.1998**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(71) Applicant:
Guala Dispensing S.P.A.
15047 Alessandria (IT)

(72) Inventor: **Gramola, Marco**
15011 Acqui Terme - Alessandria (IT)

(74) Representative:
Perani, Aurelio et al
c/o JACOBACCI & PERANI S.p.A
Via Senato 8
20121 Milano (IT)

(54) Spray pump for liquids

(57) Manually operated spray pump for liquids, comprising a trigger (13), a piston (17) operated by the said trigger in opposition to a reaction spring (32) and movable axially within a cylindrical chamber (2) for the compression of liquid (24) sucked from a container (23) which can be grasped in one hand, a suction duct (18, 22), one of whose ends extends inside the container (23) to a point near its base and the other of whose ends (28) is connected to the said cylindrical chamber (2), a supply duct (10) communicating at one end with the said cylindrical chamber (2) and at the other end with an atomizer member (11), first valve means (4, 15, 16, 5, 6) interposed between the said supply duct (10) and the said cylindrical chamber (2), second valve means (27) interposed between the suction duct (18) and the cylindrical chamber (2), and a base element (8, 9) for mounting the pump on the mouth (35) of the said container (23), for supporting the said cylindrical chamber (2) and the said supply duct (10).

The pump includes a device (46) for supplementary access of the liquid to the pump, the said device comprising a first channel (49), disposed along the suction duct (22) which extends into the container (23) to a point near its base, a second channel (48) which extends parallel to the first (49) with one end opening inside the container (23) near its mouth (35) and with the other end opening into a transverse passage (51) for connection to the said first channel (49), a first valve member (55) positioned in the said connecting passage (51) to shut off the said suction duct (22), and a second valve member (50) positioned in the said second channel (48) to open the latter towards the interior of the container (23) when the pump and the container are operated in the inverted position, and to cause it to communicate with the suction duct (22).

The first said valve member enables the pump to be primed rapidly even in the case of poor sealing of the valve means (27) interposed between the supply duct (10) and the liquid compression chamber (2).

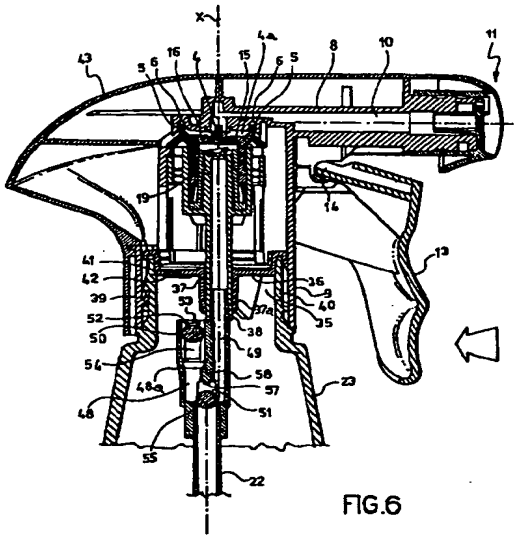

FIG.6

EP 0 968 767 A1

ISDOCID: <EP__0968767A1_I_>

Description

[0001] The present invention relates to a manually operated spray pump for liquids, comprising a trigger, a piston operated by the said trigger in opposition to a reaction spring and movable axially within a cylindrical chamber for the compression of liquid sucked from a container which can be grasped in one hand, a suction duct, one of whose ends extends inside the container to a point near its base and the other of whose ends is connected to the said cylindrical chamber, a supply duct communicating at one end with the said cylindrical chamber and at the other end with an atomizer member, first valve means interposed between the said supply duct and the said first chamber, second valve means interposed between the suction duct and the said cylindrical chamber, and a base element for mounting the pump on the said container, for supporting the said cylindrical chamber and the said supply duct.

[0002] Spray pumps of the aforementioned type are well known in the specific field and are used to spray the widest range of types of products, including cleaning liquids.

[0003] One example is illustrated in the patent US-A-4.161.288. In use, the container is normally kept in a vertical position with the spray apparatus uppermost; in this position, there is clearly no risk of gravitational leakage of liquid due to any infiltration of the liquid through the members connecting the pump to the neck of the container, and there is no need to provide the connection with special sealing devices or arrangements.

[0004] However, there is also a widespread practice of using spray pumps with the containers inverted in a vertical or near-vertical position, to spray the liquid on parts to which access is difficult.

[0005] To permit this method of use, in which the connection between the spray apparatus and the container is also inverted, suitable and conventional sealing members are provided in the said connection in order to prevent the outflow of the liquid, together with suitable intake devices in the liquid suction duct which enable the liquid to be collected not only when the container is in its normal vertical position, with the spray device uppermost, but also when it is inverted and the liquid accumulates at the connection between the container and the pump, leaving uncovered the aperture of the suction duct, which, as is known, is positioned near to the closed base of the container.

[0006] An example of a spray pump with the container equipped to enable it to operate additionally in the inverted position is shown by way of example in the patent US-A-4.277.001.

[0007] In the development of the technology of spray pumps for liquids, there has also been a widely experienced need to reduce the weight of the various mechanisms by simplifying as far as possible the structure and number of the components, although this creates sealing problems, especially in the area of the valve members, which are manifested in serious difficulties in priming the pump, particularly after a prolonged period of non-use.

[0008] These problems become more acute at the time of transition from operation of the pump with the container inverted to operation in the normal position.

[0009] The object of the present invention is therefore to provide a spray pump structure capable of being used even in the inverted position with highly reliable sealing and rapid priming, even when the pump has remained inactive for a long period.

[0010] This object is achieved with a pump whose characteristics are disclosed in the attached claims.

[0011] The invention will now be described in greater detail with reference to an example of a preferred embodiment of it, provided for information in the attached drawings, in which

Figure 1 shows, in transverse section, the pump according to the invention, mounted on a container of the liquid to be sprayed, illustrated in the vertical position with the pump uppermost;

Figure 2 shows, in transverse section, the pump shown in Figure 1 with the container and pump in the inverted position;

Figure 3 shows, in transverse section, on an enlarged scale, the pump according to the invention, with the mechanisms in the rest position, before the start of a spraying operation;

Figure 4 shows, in transverse section, the pump shown in Figure 3 with the mechanisms shown in an intermediate position, after the start of the spraying operation and before its end;

Figure 5 shows, in transverse section, the pump shown in Figure 3 with the pumping mechanisms shown in an intermediate position during the phase of suction of the liquid;

Figure 6 shows, in transverse section, the pump shown in Figure 3 during the phase of pumping in the case of defective sealing in the disc valve.

[0012] With reference to the aforesaid figures, it will be seen that the pump according to the invention comprises a cylindrical body 1 which extends axially in the direction of the vertical axis X-X; this cylindrical body forms a cylindrical chamber 2 with an open end 3 and a base closed by the wall 4. This wall is provided with an annular rim 5 which is engaged, in an axially slidable way, in an annular channel 6 carried by a body 7 which forms two cylindrical extensions 8 and 9 which are orthogonal with respect to each other.

[0013] The extension 8, which is perpendicular to the axis X-X, forms in its interior the supply duct 10 which terminates in a conventional atomizer member indicated as a whole by the number 11.

[0014] The extension 9, which extends parallel to the axis X-X and concentrically with the cylindrical body 1, forms the housing 12 for the pump and forms the base

DOCID: <EP___0968767A1_I_>

for the support and operation of the trigger 13 by which the pump is put into action.

[0015] In particular, the trigger 13 is movable angularly about the pivot 14.

[0016] The supply channel 10 is connected to the said cylindrical chamber 2 through the passages 15 and 16.

[0017] In the rest position, the base wall 4 fits closely onto the opposing surface of the body 7 and the passages 15 and 16 are therefore closed. These passages, together with the wall 4 and the body 7, form the first valve means interposed between the chamber 2 and the supply duct 10.

[0018] A piston 17, with an axial cavity 18, is operated by the trigger 13 for a reciprocating movement along the axis X-X, and its extension 19 which extends within the cylindrical chamber 2 is provided with axial ribs 20 disposed in the form of a cross on the inner surface.

[0019] From the said piston 17, in a direction opposite that of the extension 19, there extends coaxially a tubular body 21 which forms in its inner part the extension of the axial cavity 18 which is connected, in a way which will be described subsequently, to the suction duct 22 which extends inside the container 23 in which the liquid to be sprayed 24, particularly a cleaning liquid, is located.

[0020] The container 23 is connected by conventional fastening means and suitable sealing members to the tubular base extension 9.

[0021] A sleeve 25, whose free end 26 is provided with a disc valve 27 which interacts with the mouth 28 of the said extension 19 in such a way as to keep it closed during the phase of compression of the liquid to be sprayed and to keep it open during the phase of suction of the liquid through the ducts 22 and 18, is fitted on to the extension 19 of the piston 17.

[0022] The said piston 17 is operated, so that it moves in a reciprocating way along the axis X-X, by the trigger 13 through lever-type connecting members which are not illustrated since they are not necessary for the understanding of the present invention.

[0023] A tubular sleeve, of which one part 29 extends to engage slidably with the wall of the cylindrical body 1 from the outside, is provided coaxially with the extension 19 of the piston 17 and is integral with the peripheral edge of the said piston.

[0024] Around the part 29 of the tubular sleeve there is disposed an annular collar 30 which forms a seat 31 for one end of the spring 32 whose other end is engaged in the seat 33 formed by the flange 34 which is integral with the said first cylindrical body 1.

[0025] The mouth 35 of the container 23 is closed by a transverse wall 36 provided with a central aperture 37 through which the tubular body 21, forming the duct 18 in its inner part, passes slidably.

[0026] The rim of the said aperture 37 provides, by interaction with the outer surface 38 of the tubular body 21, sufficient sealing to prevent the liquid from filtering along the said surface even if the container 23 is held in the inverted position and the pump, also inverted, is in the underneath position, as illustrated in Figure 2.

[0027] Inside the tubular base extension 9 there are also disposed the means, indicated schematically by the number 39, for enabling the spray pump to be joined to the neck 40 of the container 23.

[0028] The last of these, in particular, is made by press-moulding from conventional plastic material with thin walls.

[0029] In order to prevent the collapse of the container 23 as a result of the vacuum created inside it during operation, the transverse wall 36 is provided with a valve device capable of balancing the internal pressure with the pressure outside the container. This valve device consists of a hole 41 covered by a membrane 42 of a known material which is impermeable to liquids but permeable by gases, particularly air.

[0030] The spray pump is completed by a conventional cover indicated by the number 43.

[0031] The tubular body 21 through which the suction duct 18 passes is connected, at the end 44, to the connection 45 of a supplementary access device, indicated as a whole by 46, which enables the suction duct 18 to be supplied even with the container 23 inverted (Figure 2) in which position the duct 22 is no longer capable of sucking the liquid.

[0032] This access device 46 consists of a body 47 which comprises an access channel 48 which extends parallel to a channel 49 connected to the duct 18 through the connection 45. The channel 48 is provided with a conical portion 48a forming the seat for a first ball valve 50. The said channel 48 is connected to the duct 18 by means of a passage 51 and has an aperture 52 facing the transverse wall 36. The internal projections 53 prevent the ball 50 from falling by gravity out of the duct 48 when the container 23 is inverted.

[0033] An aperture 54, provided on the wall of the duct 48, permits the entry of the liquid when this is sucked up with the container 23 in the inverted position and the ball 50 bears, by gravity, on the projections 53.

[0034] The body 47 also comprises a second ball valve 55 positioned in the passage 51. This ball 55 closes and opens the orifice 56 of the suction duct 22 following an axial displacement between the said orifice 56 and an opposing projection 57 formed in the wall 58 which separates the channels 48 and 49 of the body 47.

[0035] During operation, either with the container kept in its normal vertical position shown in Figure 1, or in the inverted position shown in Figure 2, the liquid to be sprayed is sucked up inside the cylindrical chamber 2 during the movement of the extension 19 of the piston 17 emerging from the chamber 2.

[0036] The vacuum created inside the container 23 following the repeated suction of the liquid is compensated by the external air which automatically passes through the gas-permeable membrane 42 disposed on the hole 41 of the transverse wall 36.

[0037] In this way the collapse of the container is pre-

ISDOCID: <EP___0968767A1_I_>

vented, even when the container is made with very thin walls.

[0038] The spraying of the liquid 24, which has entered the cylindrical chamber 2 during suction, is achieved by the axial movement of the extension 19 of the piston 17 inside the said cylindrical chamber 2, while the disc valve 27 is kept closed by the pressure which is established inside the chamber.

[0039] The liquid 24, pressurized in the chamber 2, also flows into the passages 15 and 16 formed in the thickness of the base wall 4, and passes beyond the said base wall.

[0040] As may be seen in Fig. 4, the pressurized liquid which has passed through the wall 4 causes an axial thrust which overcomes that of the spring 35, moving the body 1 axially in the opposite direction to that of the piston 17.

[0041] This movement causes the area 4a behind the wall 4 to be connected to the supply duct 10, and then also causes the hydraulic connection of the latter, through the passages 15 and 16, to the cylindrical chamber 2.

[0042] If there should be a defect in the sealing of the disc valve 27, due to its constructional simplicity or to a prolonged period of inactivity, during the pumping action, when pressure is created inside the chamber 2, the ball valve 55 is pushed by the pressure against the orifice 56 of the duct 22, causing it to be closed (Fig. 6). Any air which is present in the chamber 2, having accumulated as a result of repeated pumping actions carried out to prime the pump, is discharged into the container 23 through the passage 51, the channel 48 and the apertures 52 and 54 without entering the suction duct 22. In this way the liquid which has previously been sucked up and which is located along the duct 22 is prevented from falling back into the container 23 and thereby causing problems with the priming of the pump.

Claims

1. Manually operated spray pump for liquids, comprising a trigger (13), a piston (17) operated by the said trigger in opposition to a reaction spring (32) and movable axially within a cylindrical chamber (2) for the compression of liquid (24) sucked from a container (23) which can be grasped in one hand, a suction duct (18, 22), one of whose ends extends inside the container (23) to a point near its base and the other of whose ends (28) is connected to the said cylindrical chamber (2), a supply duct (10) communicating at one end with the said cylindrical chamber (2) and at the other end with an atomizer member (11), first valve means (4, 15, 16, 5, 6) interposed between the said supply duct (10) and the said cylindrical chamber (2), second valve means (27) interposed between the suction duct (18) and the cylindrical chamber (2), and a base element (8, 9) for mounting the pump on the mouth (35) of the said container (23), for supporting the said cylindrical chamber (2) and the said supply duct (10), characterized in that it includes a device (46) for supplementary access of the liquid to the pump, the said device comprising a first channel (49), disposed along the suction duct (22) which extends into the container (23) to a point near its base, a second channel (48) which extends parallel to the first (49) with one end opening inside the container (23) near its mouth (35) and with the other end opening into a transverse passage (51) for connection to the said first channel (49), a first valve member (55) positioned in the said connecting passage (51) to shut off the said suction duct (22), and a second valve member (50) positioned in the said second channel (48) to open the latter towards the interior of the container (23) when the pump and the container are operated in the inverted position, and to cause it to communicate with the suction duct (22).

2. Pump according to Claim 1, characterized in that the said first and the said second valve members consist of balls movable by gravity and corresponding conical seats, and in that the said first valve member (55) closes the orifice (56) of the suction duct (22) by gravity during the pumping phase with the pump and container in the normal position.

3. Pump according to Claims 1 and 2, characterized in that it comprises a transverse wall (36) for closing the mouth (35) of the container (23), the said transverse wall (36) being provided with a central aperture (37) through which the said suction duct (18, 21) passes slidably, the rim (37a) of the said aperture (37) being engaged with the outer surface (38) of the said duct (21) and forming with the latter an active liquid seal during the operation of the pump in the inverted position.

4. Pump according to Claim 1, characterized in that the said piston (17) is provided with an axial extension (19) which is slidable inside the said cylindrical chamber (2) and with a collar (29) which is engaged slidably with the outer wall of the said cylindrical chamber (2).

5. Pump according to Claim 4, characterized in that the said collar (29) is provided, on its outer wall, with an annular seat (31) with a closed base and an axially open end facing the said supply duct (10), the said annular seat (31) forming a housing and stop for one end of the said reaction spring (32).

6. Pump according to Claims 4 and 5, characterized in that the said cylindrical chamber (2) is provided with a base wall (4) facing the said supply duct (10); with axially slidable means of engagement (5) for con-

SDOCID: <EP___0968767A1_I_>

nection of the said base element to passages (15, 16) for the liquid, formed in the thickness of the said base wall (4); and with an annular cavity (33) projecting outside the said chamber, the said annular cavity (33) forming a seat and stop for the other end of the said reaction spring (32).

7. Pump according to Claims 1 to 6, characterized in that the said suction duct (18) extends axially inside the said piston (17) and opens into the said cylindrical chamber (2) through an aperture (28) disposed on the frontal wall of the extension (19) of the said piston.

8. Pump according to Claims 1 to 7, characterized in that the said valve means are provided at the said aperture (28) of the extension (19) of the piston (17) which opens into the said cylindrical chamber (2).

9. Pump according to Claims 1 to 8, characterized in that the said valve means are in the form of an elastically flexible disc (27) carried on the end of a sleeve (25) fitted on the outer surface of the said extension (19) of the said piston (17), the said disc (27) being positioned, by means of the said sleeve, over the said aperture (28) of the suction duct (18).

NSDOCID: <EP___0968767A1_I_>

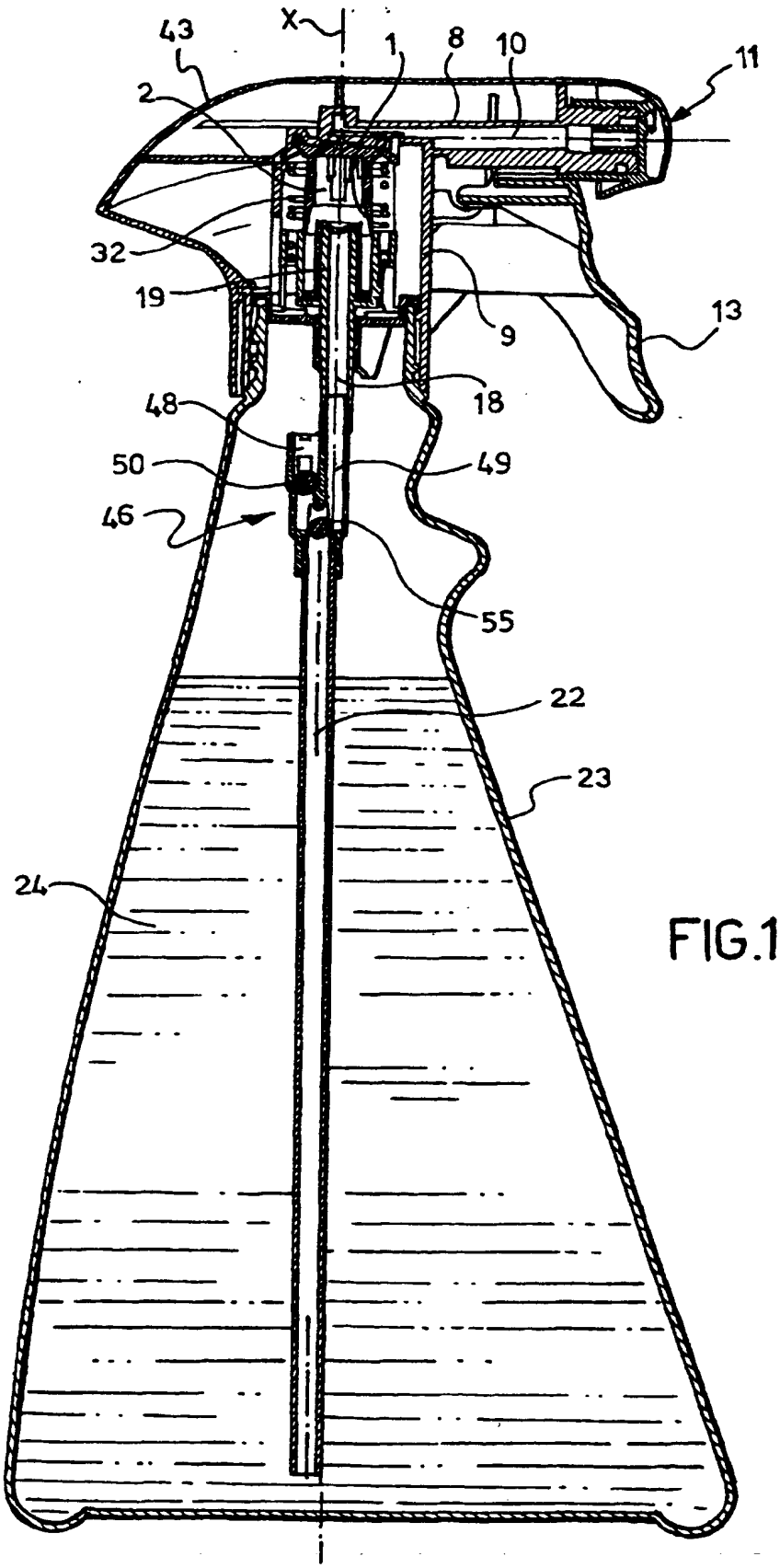

FIG.1

DOCID: <EP___0968767A1_I_>

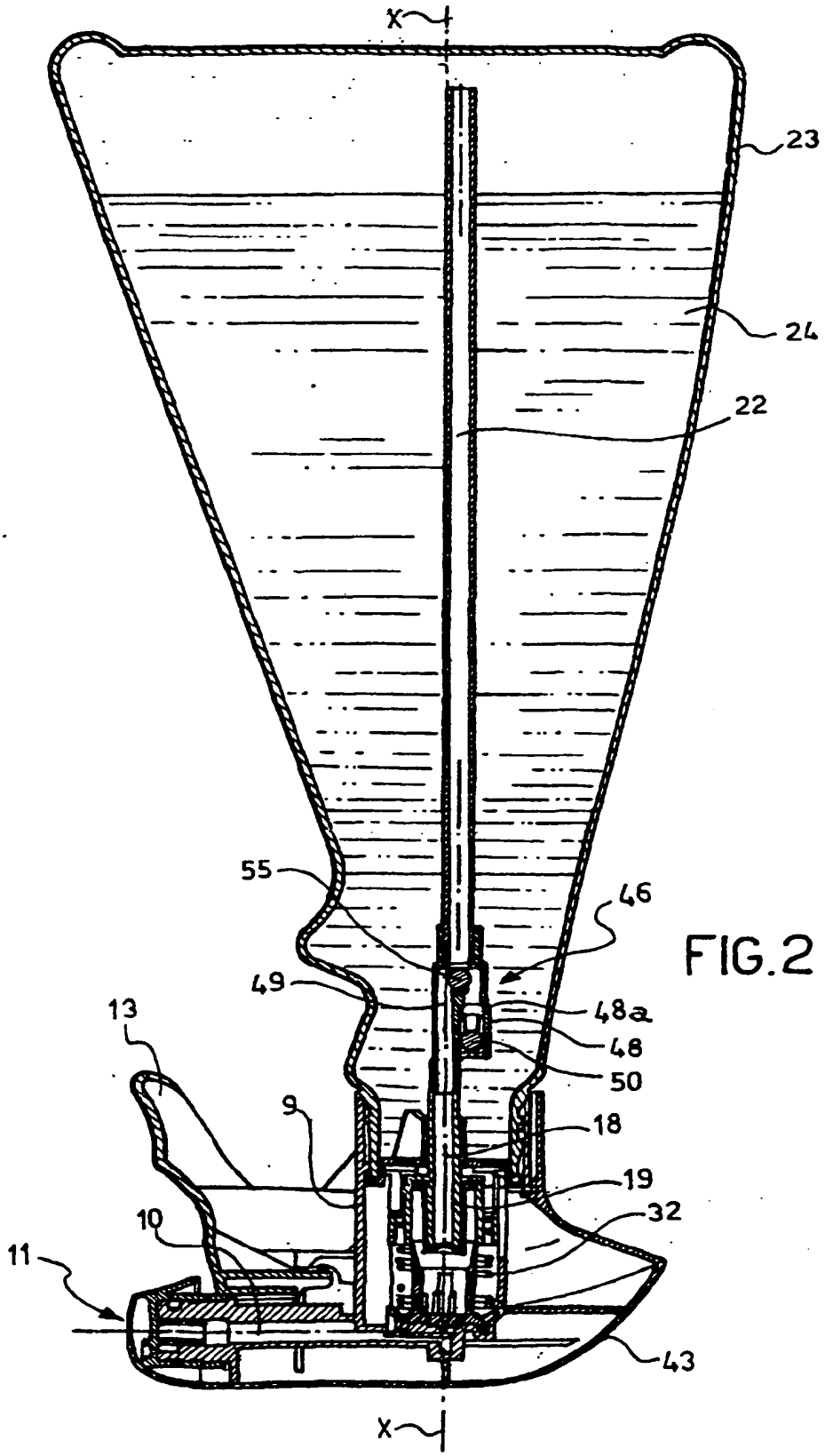

FIG.2

ISDOCID: <EP___0968767A1_I_>

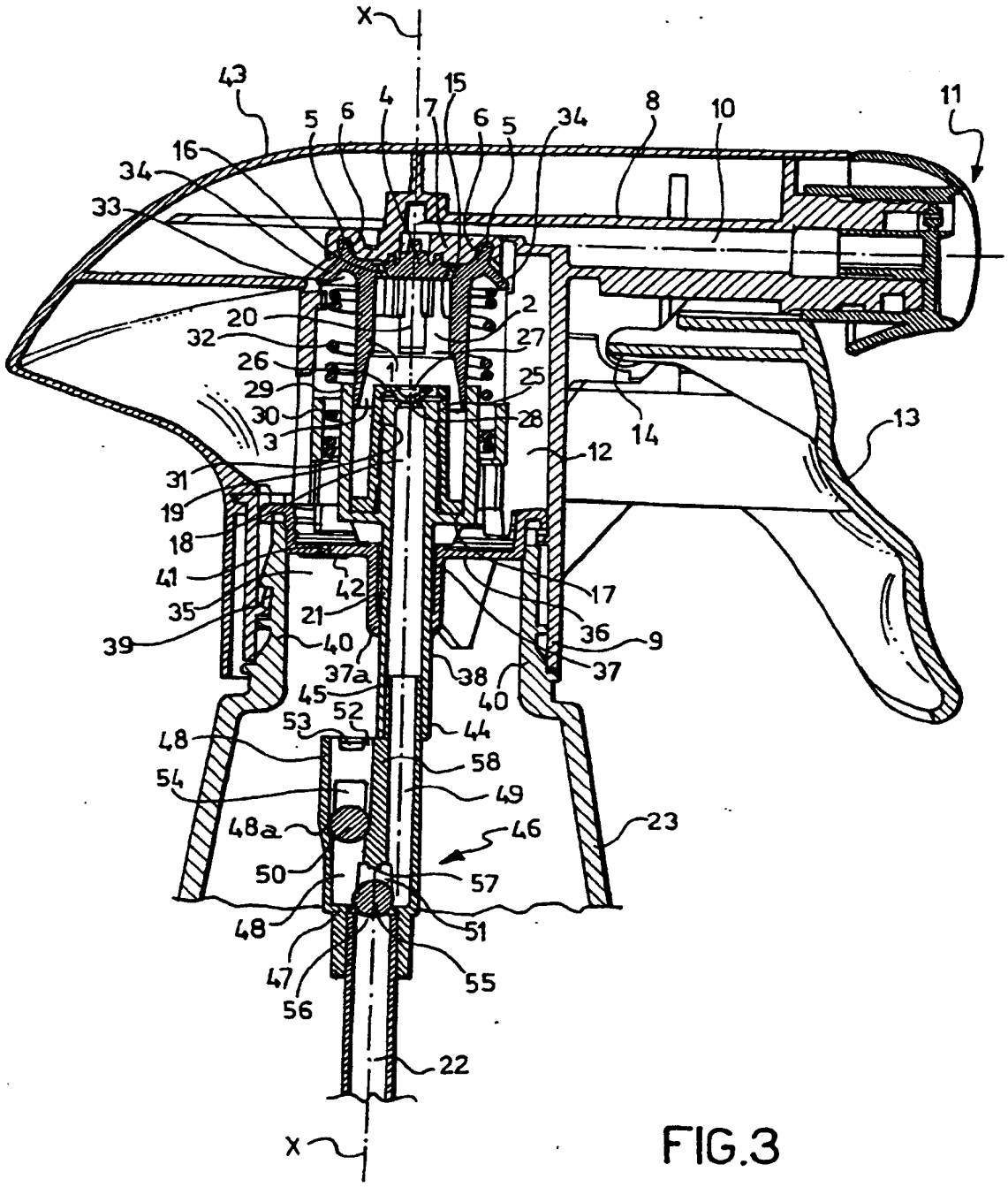

FIG.3

DOCID: <EP___0968767A1_I_>

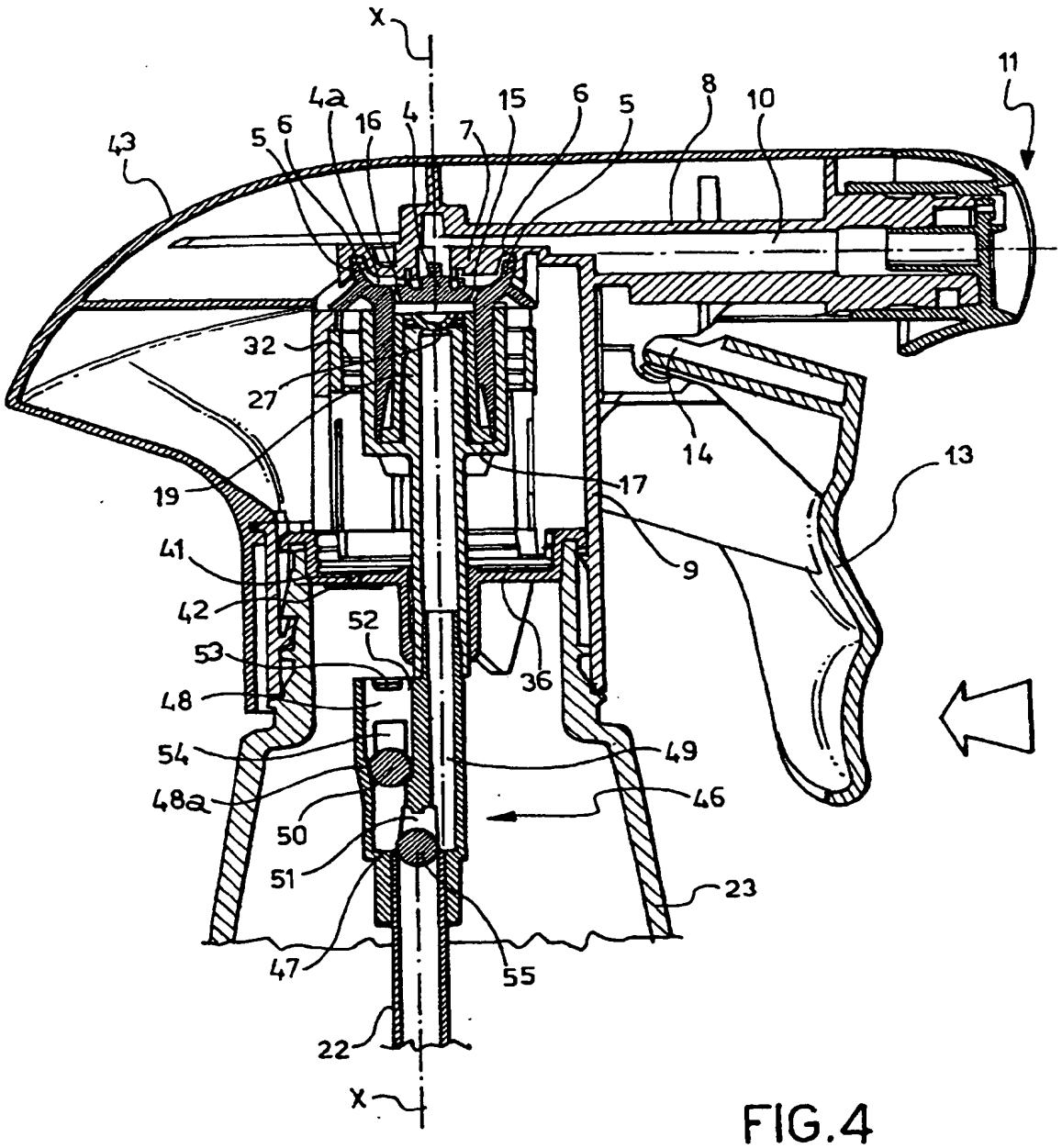

FIG.4

VSDOCID: <EP___0968767A1_I_>

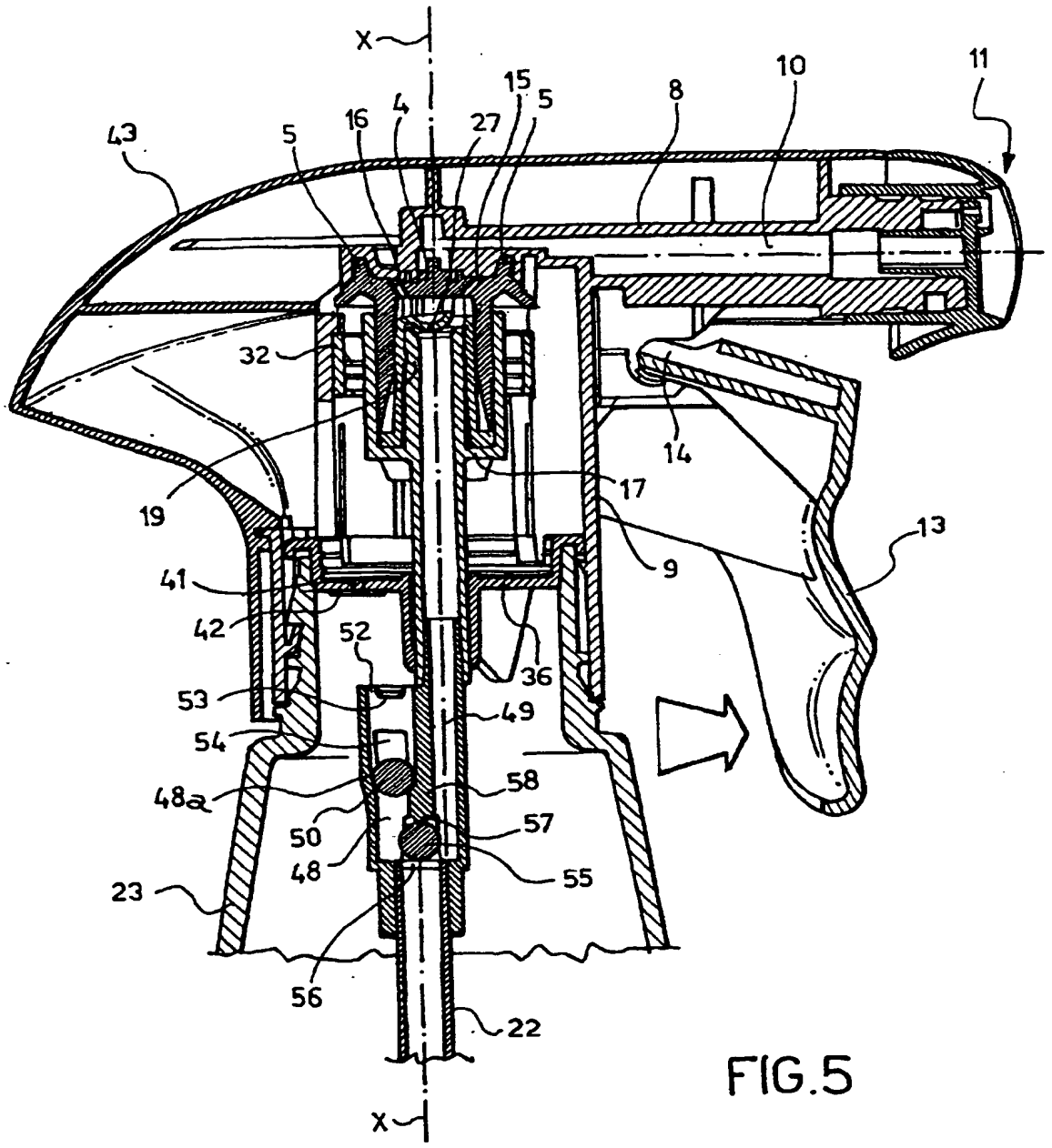

FIG.5

DOCID: <EP___0968767A1_I_>

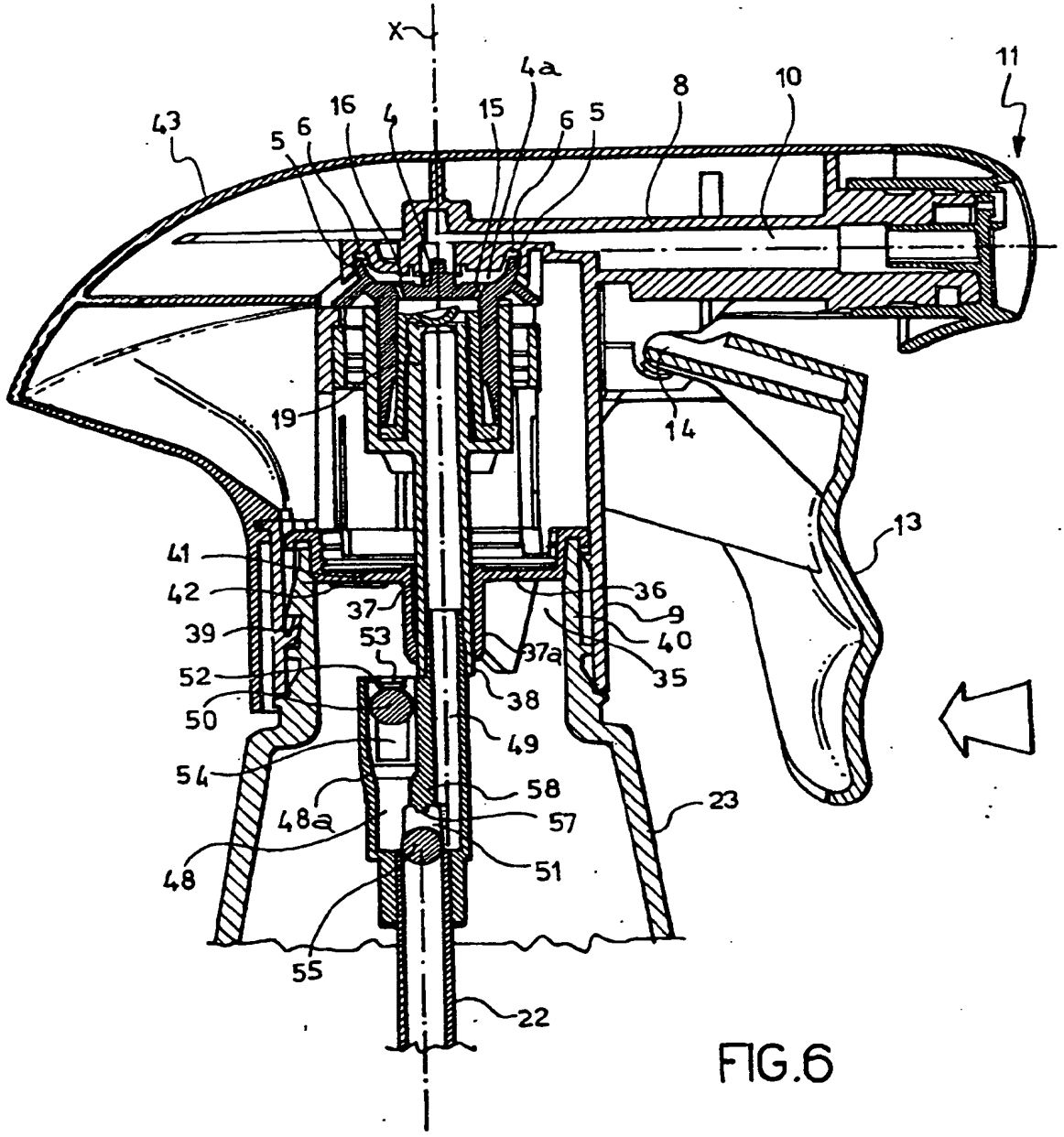

FIG.6

ISDOCID: <EP 0968767A1 I >

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0389

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 196 46 830 C (FRAUNHOFER GES FORSCHUNG) 26 March 1998 (1998-03-26) * column 3, line 31 - column 4, line 28 * * column 4, line 67 - column 5, line 54; figures 1,2,13 *	1	B61K9/08 B61L3/06
A	DE 40 26 649 C (MESSERSCHMITT-BÖLKOW-BLOHM GMBH) 20 February 1992 (1992-02-20) * column 2, line 10 - line 52; figures 1-4 *	1	
A	DE 23 04 244 A (SIEKE HELMUT) 1 August 1974 (1974-08-01) * page 4, line 12 - page 7, line 5; figures 1-3 *	1	
A	DE 42 38 034 C (SARTORI MICHAEL DIPL ING) 31 March 1994 (1994-03-31) * column 7, line 47 - column 9, line 56; figures 2-6 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B61K
B61L
G01S

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 November 1999	Chlosta, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

DOCID: <EP___0968767A1_I_>

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 83 0389

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-11-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19646830 C	26-03-1998	WO 9821605 A	22-05-1998
DE 4026649 C	20-02-1992	NONE	
DE 2304244 A	01-08-1974	NONE	
DE 4238034 C	31-03-1994	AU 5461494 A	08-06-1994
		DE 4395721 D	23-11-1995
		WO 9411705 A	26-05-1994
		EP 0668988 A	30-08-1995

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

ISDOCID: <EP___0968767A1_I_>